Amendments to the Specification

Replace the paragraph beginning on page 7, line 10 with the following replacement paragraph:

According to the invention, non-stationary time series are detected by a procedure in two steps: first suitable modeling and then so called drift segmentation. The purpose of the modeling is to detect a predetermined prediction model for a system mode in each time segment of a predetermined minimum length for each system parameter. Here a conventional switch segmentation is preferred as know, for example, from the publication by K. Pawelzik et al. in "Neural Computation", vol. 8, 1996, p 340 ff. Modeling is also possible by another, in relation to the derived system information for switch segmentation, equivalent procedure that is matched to a concrete application, [[eg]] for example, for known pure modes or boundary conditions.

Replace the first paragraph on page 9 with the following replacement paragraph:

Training is performed on the condition that the system modes do not chase with each time increment but exhibit a lower switching rate so that a system mode is maintained for several time increments. The assumed limit of the switching rate or number of time increments for which a system mode is maintained is initially a free input parameter and can be selected according to the application in a suitable way, for example as a function of given empirical values or by a parameter matching strategy. In the parameter matching strategy it may be intended that an initial value is specified for the switching rate and used to determine a prediction error, as discussed below ~~(see below)~~. If the chosen switching rate is too high or too low, the overspecialization or underspecialization will lead

to a prediction error that is too high. In continuation of the matching, the switching rate can then be optimized until the mean prediction error is below predetermined limits.

Replace the paragraph beginning on page 12, line 3 with the following replacement paragraph:

Two parameters 1, b together with two network indexes i, j are characteristic of each mixed system mode. The number of mixed modes is limited to simplify the calculation effort. A finite number of values a(s) are defined with 0 < a(s) < 1 and b(s) = 1 – a(s). For further simplification, equal intervals are selected between the values a(s) according to

$$a_r = \frac{r}{R+1} \quad with\ r = 1, \ldots, R \tag{3}$$

R corresponds to the number of admissible intermediate modes and is also referred to as the resolution or graduation of the interpolation between the pure modes. The resolution R can assume any value, but it is selected sufficiently low as a function of application to achieve optimum system description (especially in heavily noise-corrupted operations) and practicable calculation times, especially in consideration of the switching rate given above. As discussed below, in [[In]] practical applications ~~(see below)~~ it is possible for the resolution R to be selected manually by an operator or automatically by a control circuit as a function of an analysis result and comparison with a threshold value.

Replace the paragraph beginning on page 13, line 15 with the following replacement paragraph:

The search for the segmentation with the smallest prediction error can be made by any suitable search or iteration technique. Preferable is a dynamic programming technique equivalent to the Viterbi algorithm for HM (hidden Markov) models. Details of this are to be found, for example, in the publication "A Tutorial on Hidden Markov Models and Selected Applications in Speech Recognition" of L. R. Rabiner in "Readings in Speech Recognition" (eds. A. Waibel et al., San Mateo, Morgan Kaufmann, 1990, pp 267-296). Where HM models are concerned, drift segmentation is the most probable mode sequence that could have generated the time series to be investigated. As an extra condition, the possibility of mode changes is restricted by the T function, as discussed below ~~(see below)~~.

Please replace the last paragraph on page 20 with the following replacement paragraph:

The advantage of prediction and control is that in complex systems (for example, [[eg]] detecting chemical reactions in a reactor), possibly only allowing measurement of a few variables, which themselves do not permit direct conclusions about the state of the system and any mixed states that exist because of ambiguities of system-immanent delays, detailed information about the system can nevertheless be derived. Thus, in the example with a chemical reaction, an optimum control strategy, comprising the dosing of certain coreactants, can be derived from detection, according to the invention, of the macroscopic, thermodynamic state variables for instance.